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Scanning Journal Cover Sheet

My Name: Joseph C Thomas

Organization/Client Name: Great Lakes Energy Company

Organizational Mission: Great Lakes Energy Company is a leading, full service integrated energy company that provides energy solutions to meet the needs of 21st century customers.

Scanning Levels:

1. Organization's Critical Issue

The critical issue is remaining competitive and profitable in the face of energy market deregulation while meeting state and federally mandated requirements that include maintaining the energy distribution and transmission infrastructure, meeting environmental standards, providing adequate power reserves to cover potential demand, and ensuring that all customers (including low income) are served. Deregulation of utilities fosters much needed competition in the marketplace, yet third party energy generators and marketers do not share equally the cost burden of state and federally mandated requirements.

2. Organization's Internal Environment:

The company is working hard on several important initiatives positioning for improved competitiveness, yet is struggling to integrate operations of an acquired company and to overcome complacency in the workforce often seen in older companies that have a history of operating as a regulated monopoly. These initiatives include implementation of a company operating system including lean manufacturing principles, improving employee engagement at

all levels of the organization, and reengineering business processes in conjunction with implementation of enterprise resource planning (ERP) software.

3. Profession's Work Environment:

A major factor affecting the energy industry at large is piecemeal deregulation of the utility industry across the nation on a state-by-state basis. There are many different formulas for deregulation being implemented by various states ranging from protecting the status quo to attempts at opening up energy markets to unfettered competition. The problems experienced by California's deregulation weigh heavily on utility companies, state regulators, and customers alike and have caused many states to adopt conservative approaches or defer deregulation altogether.

An additional factor is the reliability of the electricity transmission grid and the negative publicity associated with the problems of the blackout of 2003. Deregulation has resulted in interconnection of regional power grids in order to move power between adjacent regions, yet the transmission system is an aging design never intended for this purpose.

Increasing uncertainty around the mid to long term source of fuel used to generate electricity is a major concern as the price of crude oil soars due to terrorism and instability in the Middle East, availability and costs of natural gas, emission of greenhouse gases and pollution due to the burning of coal and other fossil fuels, and not-in-my-backyard public concern around nuclear generation.

4. Macro-Environment:

Alternative energy sources, which to date are low volume or largely experimental, loom on the longer horizon as current fossil fuel sources become depleted, increasingly expensive to

extract, and increasingly harmful to the environment. In the face of these issues, a resurgence in the use of nuclear fission seems likely. Alternative energy sources include solar, wind, biomass, hydrogen fuel cells, sea currents/tides, and nuclear fusion. As these technologies mature and become viable as well as cost effective, they will become increasingly attractive to energy providers and consumers alike and promise to revolutionize current methods of energy generation, delivery and consumption. High demand and costs of energy also drive innovation around energy conservation and efficiency.

Information sources:

Citizens for Long-Term Energy Affordability and Reliability (CLEAR, 2004)

Company Annual Report

Department of Energy National Transmission Grid Study (NTGS, 2001)

Energy Information Administration (EIA, 2003; EIA, 2004)

The First Measured Century (Caplow, Hicks, & Wattenberg, 2000)

Framework Document

Name: Joseph C Thomas Organization: Great Lakes Energy Company

Table 1 –Future Framework Trends

#	Trend Name	Description	Status	Source
1.	Fossil Fuels Mainstay of Electricity Generation	Coal will continue to be the predominant fuel while the use of natural gas will become the secondary fuel source for electricity generation.	Increasing	Annual Energy Outlook 2004 With Projections to 2025 (EIA, 2004) Global Energy Decisions (Electric Light & Power, 2004)
2.	Distributed Electricity Generation	Paralleling the development of computer technology in the shift from massive and powerful mainframes to smaller and smaller personal computers for every individual, electricity provision to consumers will move from centralized generation and network delivery to generation at the point of use.	Increasing	Top Ten Energy Innovations for 2010 (Battelle, 2002)
3.	Supplementing the Grid	Decentralization of energy generation and changing cost structures provides opportunities for industrial, commercial and individual consumers to use excess generation capacity to deliver electricity to the grid.	Increasing	Universal Interconnect Needs and Trends (GE, 2002)
4.	Energy Management and Conservation	The low cost of computing power, increasingly smart appliances and devices coupled with telecommunication interconnectivity provides the ability for energy consumers to optimize their energy usage decreasing consumption and shifting use patterns to take advantage of favorable off peak pricing.	Increasing	Top Ten Energy Innovations for 2010 (Battelle, 2002)

#	Trend Name	Description	Status	Source
5.	Renewable Sources of Energy	Renewable sources of energy (solar, wind, geothermal, hydroelectric, biomass, sea waves/tides, and waste) provide accessible and cost effective alternatives to fossil fuels for electricity generation over long term, but remain experimental, not cost effective, and a niche in near to mid term.	Increasing	Renewable Resources in the U.S. Electricity Supply (EIA, 2003)
6.	Green Energy World	Emissions from fossil fuels are believed to cause global warming and otherwise significantly impacting the earth's air and water quality and are incrementally driving change away from fossil fuels in the long term.	Increasing	Current and Future Energy Trends (Union of Concerned Scientists, 2003) Global Energy Decisions (Electric Light & Power, 2004)
7.	Lack of Acceptable Alternatives for Disposal of Nuclear Waste	Lack of viable sites and technologies for safe disposal of radioactive waste inhibit new construction of nuclear power plants.	Stable	Current and Future Energy Trends (Union of Concerned Scientists, 2003)
8.	Electricity from Hydrogen	Fuel cells become efficient at delivering electricity and heat with a minimal impact on the environment.	Increasing	Top Ten Energy Innovations for 2010 (Battelle, 2002)

Summary Analysis

The future framework in Table 1 depicts key longer term trends (10 to 20 years out) in the energy business for Great Lakes Energy Company. These trends pertain to energy sources, energy production, and energy delivery.

The long term trends have little bearing on the organization's critical issue because market deregulation is a short to mid term issue. Although the company works to influence the outcome though lobbying and public relations, resolution of these issues is driven primarily by market conditions in conjunction with the direction the state government establishes. No scanning hits were found that either confirms or denies this assertion. Similarly, the factors in the organization's internal environment are not longer term issues, and no scanning hits were found that either confirms or denies this assertion.

Consistent with the longer term trends in the future framework depicted in Table 1, the organization's macro environment is all about energy sources, energy production, and energy delivery. Table 2 shows the relationship between the trends in the future framework and the scanning hits.

Table 2 shows scanning hits that tend to confirm five out of the eight trends. Of these five trends, four have three or more confirming scanning hits. One has two confirming scanning hits.

Interestingly, one scanning hit ("Cleanest Air Since 1970") tended to confirm one trend ("Fossil Fuels Mainstay of Electricity Generation") while disconfirming another ("Green Energy World"). A high level of investment over the last decades in technology to clean emissions from fossil fuel fired generating plants seems to be paying off in clean air. This could make the use of fossil fuels more acceptable to the public potentially extending their use, and delay the necessity of moving to cleaner more environmentally friendly fuel sources.

One of the remaining trends (“Energy Management and Conservation”) received neither confirming nor disconfirming hits. Continued monitoring of this trend is necessary to get some indication of the likelihood of this trend.

The other remaining trend (“Lack of Acceptable Alternatives for Disposal of Nuclear Waste”) had disconfirming scanning hits. These hits indicate the possibility that acceptable methods for disposing of nuclear waste could be developed. This could change public perception about the use of nuclear technology and could change the landscape of energy production by making further development of nuclear reactors feasible.

One scanning hit (“Space Based Solar Power”) potentially resurrects an idea that seemed to have been dismissed years ago as impractical when investments in research were curtailed. This may indicate a new trend and bears close watching for new developments.

In summary, the strong confirmations of the five trends represent opportunities for the company to consider investments in several technology areas that could include research, partnerships, joint ventures, or other investments in alternative fuel and distributed generation technologies that are likely to be commercially viable in the next five to ten years. The disconfirmations indicate a need to closely watch developments in the nuclear waste disposal industry to ensure that the company is positioned to exploit advances in this area if and when they come to fruition. Additionally, it would be prudent to keep an eye on the viability of space based solar power technology over the long term.

Table 2 –Relationships between Scanning Hits and Trends

		Trends							
		1. Fossil Fuels Mainstay of Electricity Generation	2. Distributed Electricity Generation	3. Supplementing the Grid	4. Energy Management and Conservation	5. Renewable Sources of Energy	6. Green Energy World	7. Lack of Acceptable Alternatives for Disposal of Nuclear Waste	8. Electricity from Hydrogen
Scanning Hit	1. Cleanest Air Since 1970	**C**	--	--	--	--	**D**	--	--
	2. Distributed Generation on Four Wheels	--	**C**	**C**	--	--	--	--	--
	3. Power Inversion for Grid Interconnection	--	**C**	**C**	--	--	**C**	--	**C**
	4. Hydrogen from Solar Energy	--	**C**	--	--	**C**	**C**	--	**C**
	5. Plants Bioengineered for Energy Production	--	--	--	--	**C**	**C**	--	**C**
	6. Deep Geological Disposal Monitoring	--	--	--	--	--	--	**D**	--
	7. Geomelting	--	--	--	--	--	--	**D**	--
	8. Space Based Solar Power	--	--	--	--	**C**	**C**	--	--

C = Confirming
D = Disconfirming
-- = No or minimal effect

Scanning Matrix

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Relationship to Framework Baseline: (underline choice) -Confirming-- --Disconfirming-- --Creating--

Title	1. Cleanest Air Since 1970		**Author**	Environmental Protection Agency		
Source	Edison Electric Institute http://www.eei.org/		**Date**	23-Sep-2004	**Page/s**	
STEEP	Environmental	**Keywords**	EPA, air pollution, air quality			

Substance & Significance	The U. S. Environmental Protection Agency reports that emissions of six principal pollutants as defined by the Clean Air Act decreased again in 2003. The air quality is now the best it has ever been since 1970. Even though the economy has increased more than 150% since 1970, the aggregate emissions (Carbon Monoxide (CO), Nitrogen Oxides (NOx), Sulfur Dioxide (SO2), Particulate Matter (PM), Volatile Organic Compounds (VOCs) and Lead (Pb)) have been reduced from 301.5 million tons per year to 147.8 million tons per year, a decrease of 51%. Also noted is that even though air quality has improved dramatically, three quarters of the American public believes that air quality has decreased or remained the same.
Potential Implications	Could improve the company's ability to promote a positive image regarding environmental responsibility. May tend to moderate concerns about the immediacy of global warming and other environmental impacts while extending the viable time period for using fossil fuels (particularly coal).

Novelty	5	**Importance**	5	**Relevance**	5	**Timeliness**	4	**Total**	19

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Relationship to Framework Baseline: (underline choice) --Confirming-- --Disconfirming -- --Creating--

Title	2. Distributed Generation on Four Wheels		**Author**	Mark Clayton	
Source	http://www.csmonitor.com/2004/0729/p17s02-stct.html		**Date**	29-Jul-2004	**Page/s**
STEEP	Technology	**Keywords**	V2G, vehicle to grid, distributed generation		

Substance & Significance	Electric cars that are capable of generating electricity when parked so the energy can be sold to the electric utility and added to the grid are becoming feasible (known as "vehicle to grid" or V2G). Imagine thousands of individual automobiles generating significant amounts of energy for other purposes. "[If] automakers were to make 1 million next-generation V2G vehicles by 2020, they could generate up to 10,000 megawatts of electricity - about the capacity of 20 average-size power plants, according to a 2001 study by AC Propulsion, the electric vehicle maker in San Dimas, Calif."
Potential Implications	Could provide a significant source of electricity generation reducing the need for substantial investment in centralized power generation, providing additional power reserves, and/or providing emergency generation capability.

Novelty	5	**Importance**	4	**Relevance**	5	**Timeliness**	4	**Total**	18

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Relationship to Framework Baseline: (underline choice) --Confirming-- --Disconfirming -- --Creating--

Title	3. Power Inversion for Grid Interconnection		**Author**	Ed Krasnow	
Source	http://www.livepowernews.com/stories04/0831/004.htm		**Date**	31-Aug-2004	**Page/s**
STEEP	Technology	**Keywords**	Grid interconnection		

Substance & Significance	The Department of Energy and the Oak Ridge National Laboratory is funding projects to encourage adoption of distributed generation and grid interconnection technologies. "The selected project focuses on improving combined heat and power (CHP) system performance and expanding its access to more commercial markets. Inverter based, Variable Speed Generation (VSG) technology will be integrated with an advanced reciprocating engine-based CHP system that features power generation, heat recovery, and chilled water production. Variable Speed Generation enables the engine to operate independently of the grid requirement for constant frequency."
Potential Implications	Effective and reliable means of interconnecting distributed generation power sources to the grid encourages increased investment and utilization of distributed generation.

Novelty	5	**Importance**	5	**Relevance**	5	**Timeliness**	5	**Total**	20

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Relationship to Framework Baseline: (underline choice) --Confirming-- --Disconfirming -- --Creating--

Title	4. Hydrogen from Solar Energy		**Author**	Tanya Nolan	
Source	http://www.abc.net.au/worldtoday/content/2004/s1186670.htm (transcript of the World Today broadcast on national radio in Australia)		**Date**	27-Aug-2004	**Page/s**
STEEP	Technology, Environmental	**Keywords**	Hydrogen, solar		

Substance & Significance	Researchers from the University of South Wales in Australia have announced a method to create hydrogen using solar energy without producing greenhouse gases. The process uses sunlight to produce hydrogen and oxygen from water.
Potential Implications	Use of hydrogen as the fuel for fuel cells and distributed generation has the potential to satisfy a significant portion of the world's energy needs. Thus, hydrogen could be increasingly used as an alternative to fossil fuels.

Novelty	5	**Importance**	5	**Relevance**	5	**Timeliness**	4	**Total**	19

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Relationship to Framework Baseline: (underline choice) --Confirming-- --Disconfirming -- --Creating--

Title	5. Plants Bioengineered for Energy Production		**Author**	SolarAccess.com	
Source	http://www.solaraccess.com/news/story?storyid=7541#info		**Date**	15-Sep-2004	**Page/s**
STEEP	Technology	**Keywords**	Genetics, bioengineering		

Substance & Significance	A startup company launched by MIT researchers has technology that engineers plants to produce various products including fuel ethanol and hydrogen. Various types of plant varieties produce enzymes that convert plant biomass into the final product.
Potential Implications	Could be a viable alternative to the use of fossil fuels to generate electricity. Tends to facilitate wider adoption of distributed generation.

Novelty	5	**Importance**	4	**Relevance**	4	**Timeliness**	5	**Total**	18

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Relationship to Framework Baseline: (underline choice) --Confirming-- --Disconfirming -- --Creating--

Title	6. Deep Geological Disposal Monitoring		**Author**	Dave Sanders	
Source	Innovations Report http://www.innovations-report.de/html/berichte/umwelt_naturschutz/bericht-33401.html		**Date**	10-Sep-2004	**Page/s**
STEEP		**Keywords**			

Substance & Significance	A consortium of European government and private industry has developed technology intended to monitor rock barriers at underground radioactive waste storage sights. This technology consists of an ultrasonic hardware and software system that has been successfully tested to show the changes that occur in rock properties such as crack density, crack size and orientation, and fluid content.
Potential Implications	Deep geological disposal is a promising method of managing the radioactive waste associated with nuclear reactors. Effective disposal methods that are accepted by the public would tend to promote further investment in new nuclear reactor plants.

Novelty	5	**Importance**	4	**Relevance**	4	**Timeliness**	5	**Total**	18

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Relationship to Framework Baseline: (underline choice) - Confirming-- --Disconfirming -- --Creating--

Title	7. Geomelting		**Author**	David Harrison	
Source	telegraph.co.uk http://news.telegraph.co.uk/news/main.jhtml?xml=/news/2004/09/26/nnuke26.xml&sSheet=/news/2004/09/26/ixhome.html		**Date**	26-Sep-2004	**Page/s**
STEEP		**Keywords**	Nuclear power, nuclear waste		

Substance & Significance	A British company announced a process that enables the safe storage of nuclear waste for 200,000 years (which is longer than radioactivity lasts). The technique, called geomelting (or vitrification), mixes radioactive waste with soil in large tanks and heats the mixture to 3000C. This results in a molten material that is cooled to form a large glass block harder than concrete.
Potential Implications	Effective disposal methods that are accepted by the public would tend to promote further investment in new nuclear reactor plants.

Novelty	5	**Importance**	4	**Relevance**	4	**Timeliness**	4	**Total**	17

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Relationship to Framework Baseline: (underline choice) - Confirming-- --Disconfirming -- --Creating--

Title	8. Space Based Solar Power		**Author**	compoundsemiconductor.net	
Source	compoundsemiconductor.net http://compoundsemiconductor.net/articles/magazine/10/8/5/1		**Date**	Aug-2004	**Page/s**
STEEP		**Keywords**	Solar power, space solar power		

Substance & Significance	The investment in research for the collection of solar power using satellites and wireless transmission of the energy to earth has been minimal since NASA decided to stop funding of their research in 2001. However, the successful deployment and testing of a new solar cell array offers hope for the viability of solar power from space. This is the first step in a demonstration project that includes an end-to-end power-beaming demonstration using either a microwave or a laser beam to direct the generated energy and a NASA-designed power converter This project was presented at the Solar Power From Space conference held in Granada, Spain, in July 2004 (the first such conference since 1991).
Potential Implications	The prospect of such a clean and abundant supply of energy is extremely attractive. Significant investment in research for this technology could alter the course of energy production for the world.

Novelty	5	**Importance**	5	**Relevance**	4	**Timeliness**	3	**Total**	17

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